

### REMARKS

Reconsideration and allowance of this application are respectfully requested in light of the following remarks.

Claims 2, 3, and 5 stand withdrawn as being directed toward non-elected subject matter.

Claims 1, 4, 6, and 8 stand rejected, under 35 USC §103(a), as being unpatentable over Daoud (US 4,835,791) in view of Muzzi (US 3,628,155). The Applicants respectfully traverse these rejections as follows.

In summary, claim 1 defines a modulation apparatus that performs single side band (SSB) modulation to obtain a lower side band (LSB) signal using a carrier frequency that is higher, by the fundamental frequency of an input symbol, than a carrier frequency that is used to obtain an upper side band (USB) signal, such that the LSB signal and USB signal are multiplexed in the same frequency band.

The Office Action proposes that Daoud discloses, in Fig. 2, a single side band (SSB) modulator 30 that produces an upper side band (USB) signal (see Office Action section 5, first bullet). However, it is noted that Daoud clearly illustrates in Fig. 2 that the signal produced by SSB modulator 30 (as characterized in the Office Action) and output by summer 40 is the lower side band (LSB) signal, as indicated by the label "LSB" on the output of summer 40 (see Daoud col. 4, lines 5-11).

Similarly, the Office Action proposes that Daoud's SSB modulator 50 produces an LSB signal (see Office Action section 5, second bullet). However, it is noted that Daoud illustrates in Fig. 2 that the signal produced by SSB modulator 50 (as characterized in the Office Action) and

output by summer 60 is the USB signal, as indicated by the label "USB" on the output of summer 60 (see Daoud col. 4, lines 27-30).

Based on the Office Action's misconstruction of which of Daoud's modulators produces the LSB signal and which produces the USB signal, the Office Action concludes that the carrier frequency used to generate Daoud's LSB signal is higher than the frequency used to generate Daoud's USB signal.

However, as stated by Applicants in the remarks of their Amendments filed May 29, 2009, and February 26, 2010, Daoud expressly discloses that "the frequency of the second carrier signal  $W_{c2}$  used in the upper sideband generator is slightly higher than the frequency of the first carrier signal  $W_{c1}$  used in the lower sideband generator" (see Daoud col. 4, lines 38-41).

The Office Action appears to presume that both of Daoud's sideband generators may be characterized as either an LSB generator or a USB generator. Such is not the case because Daoud's LSB generator does not create a frequency-shifted signal that is identical to Daoud's USB generator; instead, Daoud's LSB generator produces a mirror image signal of that produced by Daoud's USB generator, as illustrated, for example, in Applicants' Figs. 4C, 6A, and 6B. As applied to Applicants' Fig. 4C, the signal having the orientation illustrated in the upper Cartesian coordinate system is conventionally characterized as the upper sideband signal and the signal having the orientation illustrated in the lower Cartesian coordinate system is conventionally characterized as the lower sideband signal. Thus, the Office Action's attempt to characterize Daoud's signals as an LSB signal and a USB signal based upon which has the highest frequency component has the effect of misrepresenting which of the two signals is conventionally characterized as the LSB signal and which is characterized as the USB signal.

By using a higher carrier frequency to obtain an LSB signal than that used to obtain a USB signal, as recited in Applicants' claim 1, the LSB signal may be shifted along the frequency axis so as to overlap, along the frequency axis, the USB signal, as illustrated in Applicants' Fig. 4D, for example. Daoud's modulator does not produce such overlap in the LSB and USB signals, as is acknowledged in the Office Action (see Office Action page 4, lines 6-9). And neither does Muzzi's adder 17, as proposed in the Office Action (see Office Action page 4, penultimate paragraph). Muzzi's adder 17 performs the same multiplexing function as does Daoud's adder/summer 70 and produces mirror-image LSB and USB signals about the carrier frequency, as illustrated in Muzzi's Fig. 4. Daoud's adder/summer 70 similarly produces mirror-image LSB and USB signals about the carrier frequency with the LSB signal having lower frequency components than the carrier frequency and the USB signal having higher frequency components than the carrier frequency.

By contrast to the disclosures of Daoud and Muzzi, the Applicants' claimed subject matter frequency shifts the LSB signal into the same frequency spectrum used by the USB signal so that both signals may be conveyed in half the bandwidth required than if the LSB signal were not shifted along the frequency axis. Applicants' Fig. 4D illustrates an example of the Applicants' claimed subject matter in which the LSB signal is shifted along the frequency axis to occupy the same frequency spectrum as the USB signal, such that the LSB and USB signals maintain their conventional mirror-image orientations. It is submitted that the combined teachings of Daoud and Muzzi do not disclose this subject matter.

It should be noted that references above to the present specification and drawings are for illustrative purposes only and are not intended to limit the scope of the invention to the referenced embodiments.

Accordingly, Applicants submit that the teachings of Daoud and Muzzi, even if combined as proposed in the Office Action, still would lack the above-noted subject matter of claim 1 and thus these references, considered individually or in combination, do not render obvious the subject matter defined by claim 1. Claim 4 similarly recites the above-mentioned subject matter distinguishing apparatus claim 1 from the applied references, but with respect to a method. Therefore, allowance of claims 1 and 4 and all claims dependent therefrom is warranted.

In view of the above, it is submitted that this application is in condition for allowance, and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,

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